Quality of Certain Ready-to-Eat Fish Products of the Domestic Trade

T. S. GOPALAKRISHNA IYER, P. R. G. VARMA and C. C. PANDURANGA RAO
Central Institute of Fisheries Technology, Cochin - 682 029
and
K. GEORGE JOSEPH and T. S. UNNIKRISHNAN NAIR
Research Centre of Central Institute of Fisheries Technology, Calicut - 673 005

Quality of 181 samples of ready-to-eat fish products comprising fried fish, fish curry and fish/prawn pickles collected from Cochin and Calicut were studied. *Salmonella* was absent in all the samples. *V. cholerae* was tested in the samples collected at Cochin and was absent in all the cases. Coliforms, *E. coli*, faecal streptococci and coagulase-positive staphylococci were present in some of the samples studied. The study indicated the necessity to improve the sanitary and hygienic conditions of the hotels engaged in the preparation of these products. The study further indicated that fried fish and fish curry shall not be served after 6 hours of their preparation. Added care is to be exercised in the selection of shrimps and fish for the preparation of pickles.

In India, considerable amount of work has been done on the quality of fish and shellfish of the export trade. Studies carried out upto 1974 have been reviewed by Mathen (1974). Later studies on the subject are those of Varma *et al.* (1982) and Thomas & Varma (1982). With regard to fishery products of the domestic trade, sufficient information is available on the quality of dried fishes (Pillai *et al.* 1956; Srinivasan & Joseph, 1966; Srinivasan et al, 1967; Mathen, 1970, Valsan *et al.* 1982; Joseph *et al.* 1983). On the other hand, publications on the quality of fresh and frozen fishery products in the retail outlets in India are meagre (Anon, 1979; Iyer *et al.* 1982; Sanjeev *et al.* 1982) and practically no information is available on the quality of ready-to-eat fish items. The main objective of the present study is, therefore, to study the quality of some of the products like fried fish, fish curry and fish pickles collected from the consumer outlets at Cochin and Calicut.

Materials and Methods

During the course of this study, 181 samples as per details given below were studied.

	Cochin	*Calicut*
Fried fish	47	41
Fish curry	44	39
Fish/prawn pickles	10	Nil
Total	101	80
Grand total	181	

Fish curry and fried fish (each weighing about 500 g) were collected in sterile stainless steel containers from 34 different hotels situated in 5 different localities at Cochin and from 15 hotels at Calicut. Fish pickles packed in sealed glass bottles (300 g each) were purchased from the retail shops at Cochin. The samples except pickles were collected within one hour of their preparation and the analysis started within 1 h of collection of the samples. From each of the samples, 10 g were asceptically taken for the determination of total bacterial count, faecal streptococci, *E. coli* and Staph. aureus. Twentyfive grams of each of the samples were separately taken for the detection of *Salmonella* and *V. cholerae*. In the case of fish curry and fish pickles, the oily layer floating on the surface was removed before drawing the samples.

Total bacterial count at 37°C, faecal streptococci, *E. coli* and coagulase-positive

staphylococci were determined as per Indian Standard Specifications for frozen prawns (IS:2237-1971). *Salmonella* and *V. chloerae* were detected as per methods recommended by the AOAC, (1975) and IS (5887 Part-IV-1977) respectively. All the media were compounded in the laboratory as per the formulae and procedure detailed by Speck (1976). Incubation temperature was 37°C in all the cases. Counts on TG agar and KF agar were taken after 48 h whereas those on T7 agar and BP medium were taken after 24 h. Bacto dehydrated coagulase plasma was used to test the characteristic colonies grown on BP medium. Total volatile nitrogen (TVN) was determined as per Conway (1947). The taste of the product was judged by a panel of 4 experienced staff members of the Institute on a 10 point hedonic scale. Samples with score less than 5 are considered below average.

In order to study the quality changes in the fried fish and fish curry on storage at room temperature, 6 fried fish and 4 curry samples were separately collected. These samples were kept at room temperature for 12 h and their quality was studied at frequent intervals.

Results and Discussion

The quality of the samples collected from Cochin and Calicut are given in Table 1. The quality changes in the product on storage at room temperature are shown in Tables 2 and 3.

Table 1. *Quality of ready-to-eat fish products collected from Cochin and Calicut areas*

Quality factors		Cochin			Calicut	
		Fried fish	Fish curry	Fish pickles	Fried fish	Fish curry
Incidence of coliforms	%	13	17	0	20	26
Incidence of *E. coli*	%	0	5	0	0	0
Incidence of faecal streptococci	%	25	22	10	34	38
Incidence of coagulase-positive staphylococci	%	6	2	0	2	0
Incidence of *salmonella*	%	0	0	0	0	0
Incidence of *V. cholerae*	%	0	0	0	ND	ND
% samples having TVN more than 20 mg	%	36	6	50	86	93
Taste above average	%	56	64	20	39	26
Taste average	%	25	19	10	49	56
Taste below average	%	19	17	70	12	18
Total bacterial count at 37°C less than 1000/g	%	55	65	65	41	82
–do– between 1000 and 5000/g	%	15	20	10	24	13
–do– between 5001 and 10,000/g	%	15	5	10	8	3
–do– between 10,001 and 50,000/g	%	10	5	5	17	2
–do– more than 50,000/g	%	5	5	10	10	0

ND – not done

Table 2. *Quality of fish fry during storage at room temperature*

Hours at room temperature	Experiment–1			Experiment–2			Experiment–3			Experiment–4			Experiment–5			Experiment–6		
	TBC/g	TVN mg %	Taste score	TBC/g	TVN mg %	Taste score	TBC/g	TVN mg %	Taste score	TBC/g	TVN mg %	Taste score	TBC/g	TVN mg %	Taste score	TBC/g	TVN mg %	Taste score
0	3.2x 10^3	21.2	7	315	14.9	7	1.18x 10^3	14.2	8	3.2x 10^3	9.5	7	357	—	8	690	23.7	8
3	4.78x 10^3	27.2	6	3.7x 10^3	18.2	5	2.17x 10^3	18.7	7	3.4x 10^3	14.3	7	2.9x 10^3	—	8	2.19x 10^3	24.7	8
6	4.9x 10^3	27.3	6	4.2x 10^4	21.5	5	5.88x 10^3	19.2	7	7.1x 10^4	18.6	7	5.6x 10^3	—	8	1.0x 10^4	27.2	7
9	5.1x 10^5	30.5	5	2.8x 10^5	22.0	4	4.1x 10^4	21.3	6	1.7x 10^5	19.6	6	8.5x 10^3	—	7	1.1x 10^5	29.1	7
12	7.15x 10^5	31.5	4	3.8x 10^5	25.1	4	4.0x 10^6	23.5	4	3.9x 10^6	25.6	4	5.5x 10^4	—	5	4.4x 10^6	30.7	4

TBC = total bacterial count at 37°C

Table 3. *Quality of fish curry during storage at room temperature*

Hours at room temperature	Experiment–1			Experiment–2			Experiment–3			Experiment–4		
	TBC/g	TVN mg %	Taste score	TBC/g	TVN mg %	Taste score	TBC/g	TVN mg %	Taste score	TBC/g	TVN mg %	Taste score
0	5.4 x 10^4	15.6	8	4.8 x 10^4	20.9	7	4.1 x 10^5	7.1	8	2.2 x 10^5	10.6	7
3	1.47 x 10^5	20.1	8	2.92 x 10^5	21.0	7	4.4 x 10^5	9.2	8	5.3 x 10^5	12.7	7
6	6.37 x 10^5	25.9	7	9.89 x 10^5	24.6	5	1.5 x 10^6	11.5	5	2.1 x 10^6	13.6	5
9	2.27 x 10^6	35.2	5	8.5 x 10^6	26.8	2	1.1 x 10^7	11.8	2	2.6 x 10^7	17.9	2
12	4.2 x 10^6	35.8	2	1.9 x 10^7	26.9	0	2.1 x 10^7	19.8	0	4.0 x 10^7	23.7	0

TBC = total bacterial count at 37°C

The salient observations are:-

1. All the samples tested both at Cochin and Calicut were free from *Salmonella*. The samples analysed at Cochin were also free from *V. cholerae* (This organism was not tested in the samples studied at Calicut).

2. The percentage incidence of coliforms and faecal streptococci was comparatively more in the samples tested at Calicut than those studied at Cochin.

3. Five percent of the curry samples tested at Cochin contained *E. coli* but this organism was absent in all the samples analysed at Calicut.

4. Incidence of coagulase-positive staphylococci was more in the samples studied at Cochin compared to those at Calicut.

5. TVN was usually more in fried fish compared to curry.

6. In general, the curry samples were better than the fried samples in all respects except for the presence of *E. coli* in the curry samples tested at Cochin.

7. About 70% of the prawn/fish pickles tested were below average in taste. Another major defect in the prawn pickles was its powdery nature. The solid fish pieces in the fish pickles were hard to chew.

The isolation of faecal streptococci, coliforms and *E. coli* in the cooked fishery products has great public health significance. The incidence of these organisms may be due to inadequate heat treatment or post-process recontamination. But, on tasting, the products were found to be adequately cooked and, therefore, the incidence of these organisms in the products studied definitely indicate contamination after cooking. The organisms would have originated from the utensils or from the food-handlers. As the primary habitat of coagulase-positive staphylococci is human beings, the incidence of this organism, in some of the products tested, would have been from the workers handling the food material. The results indicate the necessity for improving the sanitary conditions of the hotels. Further, added care is required in the selection of fish and shrimps for the preparation of pickles.

On keeping at room temperature, fried fishes were found to have better keeping qualities compared to that of the curry samples. The fried fish had acceptable taste upto 9 h but the total bacterial count was more than 1 lakh in most cases. The curry samples, on the other hand, had acceptable taste only upto 6 h. The better keeping quality of the fried fish samples may be due to the comparatively low moisture content in these products. The total bacterial count of the curry samples included in the study is unusually high. From Table 1 and 2, it is clear that 85% and 95% of the curry samples, usually collected from Cochin and Calicut respectively have total bacterial load less than 5000/g only. The results of the present study caution that the fish curry and fried fish prepared in hotels shall not be served after 6 h of their preparation.

The authors are thankful to the Technicians of the Quality Control Section for their assistance.

Reference

Anon (1979) *Final Report of Research Scheme on All India Co-ordinated Research Project on Transportation of Fresh Fish and Utilization of Trash fish. (unpublished)*

AOAC (1975) *Official Methods of Analysis* (Horwitz, H. ed.) Association of Official Analytical Chemists, Washington

Conway, E.J. (1947) *Micro-Diffusion Analysis and Volumetric Error*. Crossby Lockwood and Sons, London, 5th edn., 199

IS:2237 (1971) *Indian Standard Specifications for Frozen Prawns* (Shrimps) First revision - ISI, Delhi

IS:5887 (1976) *Indian Standard Methods for the Detection of Bacteria Responsible for Food Poisoning. Part V Isolation Identification and Enumeration of V. cholerae* and *V. parahaemolyticus*. Indian Standards Institution, New Delhi

Iyer, T.S.G., Damle, S.P., Garg, D.K. & Nambiar, V.N. (1982) Ann. Report, C.I.F.T., Cochin, p. 37

Joseph, K.G., Muraleedharan, V. & Nair, T.S.U. (1983) *Fish. Technol.* **20**, 118

Mathen (1970) *Fish. Technol.* **6**, 213

Mathen (1974) *Fish. Technol.* **11**, 1

Pillai, V.K., Valsan, A.P. & Nair, M.R. (1956) *Indian J. Fish.* **3**, 43

Sanjeev, S., James, M.A. & Iyer, K.M. (1982) *Symp. Harvest and Post-harvest Tech. of Fish.*, 24–27 Nov., Cochin

Speck, M.L. (1976) *Compendium of Methods for the Microbiological Examination of Foods.* American Public Health. Assoc. Washington, D.C.

Srinivasan, R. & Joseph, K.C. (1966) *Fish. Technol.* **3**, 103

Srinivasan, R., Sabapathy, N. & Joseph, K.C. (1967) *Madras J. Fish.* **3**, 61

Thomas, F. & Varma, P.R.G. (1982) *Symp. Harvest and Post-harvest Tech. of Fish.* 24–27 Nov., Cochin

Valsan, A.P., Nambiar, V.N., Damle, S.P., Garg, D.K., Iyer, T.S.G. & Vasu, N. M. (1982) *Symp. Harvest and Post-harvest Tech. of Fish.* 24–27 Nov. Cochin

Varma, P.R.G., Mathen, C. & Mathew, A. (1982) *Symp. Harvest and Post-harvest Tech. of Fish.*, 24–27 Nov., Cochin